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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/661,100	09/12/2003	Gurtej S. Sandhu	303.869US1	6569
7590 06/09/2005 Schwegman Lundberg Woessner & Kluth, P.A Attn: Viet V. Tong P.O BOX 2938 MINNEAPOLIS, MN 55402			EXAMINER ZARNEKE, DAVID A	
			ART UNIT 2891	PAPER NUMBER

DATE MAILED: 06/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/661,100

**Applicant(s)**

SANDHU ET AL.

**Examiner**

David A. Zarneke

**Art Unit**

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-66 is/are pending in the application.
- 4a) Of the above claim(s) 1-49 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 50-66 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>12-16-04, 4-29-05</u> | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Election/Restrictions*

Applicant's election without traverse of Group II, claims 50-66 in the reply filed on 4/25/05 is acknowledged.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 50 and 52 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Fairburn et al. US Patent 6,573,030.

Fairburn (figures 2A-E) teaches a method comprising:

forming a device structure [250] over the substrate [200]; and  
forming a masking structure over the device structure, the masking structure including an amorphous carbon layer [204] and a cap layer [206], the cap layer including a material selected from a group consisting of boron carbide, boron nitride, silicon carbide, silicon nitride, fluoride films, fluorine doped with oxide, fluorine doped with nitride, and fluorine doped with carbide (7, 25+).

Regarding claim 52, Fairburn teaches the amorphous carbon layer is transparent in visible light range.

Claims 53, 54, and 56 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Fairburn et al. US Patent 6,573,030.

Fairburn teaches a method comprising:

forming a device structure [250] on a substrate [200];

forming an amorphous carbon layer [204] over the device structure;

forming a non-oxide cap layer [206] over the amorphous carbon layer;

patterning the non-oxide cap layer to produce a patterned non-oxide cap layer (figure 2D & 7, 45+); and

using the patterned non-oxide cap layer as a mask to pattern the amorphous carbon layer (figure 2D & 7, 45+).

Regarding claim 54, Fairburn teaches the cap layer includes one of boron carbide, boron nitride, silicon carbide, silicon nitride, fluoride films, fluorine doped with oxide, fluorine doped with nitride, and fluorine doped with carbide (7, 25+).

With respect to claim 56, Fairburn teaches the amorphous carbon layer is formed by deposition (5, 61+).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fairburn et al. US Patent 6,573,030, as applied to claim 50 above.

Though Fairburn fails to teach the material of the cap layer is in situ deposited over the amorphous carbon layer, it would have been obvious to form the cap layer in situ because this would speed up the processing time. The use of conventional methods to perform there known functions in a conventional process is obvious (MPEP 2144.07).

Claims 55, 57 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fairburn et al. US Patent 6,573,030, as applied to claim 53 above.

Regarding claim 55, though Fairburn fails to teach the carbon layer has an absorption coefficient between about 0.15 and 0.001 at a wavelength of 633 nanometers, it would have been obvious to one ordinary skill in the art at the time of the invention to optimize the absorption coefficient through routine experimentation in order to tune the optical properties and the etch selectivity, as taught by Fairburn (6, 31+) (MPEP 2144.05).

With respect to claim 57, though Fairburn fails to teach the material of the cap layer is in situ deposited over the amorphous carbon layer, it would have been obvious to form the cap layer in situ because this would speed up the processing time. The use of conventional methods to perform there known functions in a conventional process is obvious (MPEP 2144.07).

As to claim 58, Fairburn teaches the amorphous carbon layer is formed by a chemical vapor deposition process (4, 18+).

Claims 59-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fairburn et al. US Patent 6,573,030.

Fairburn teaches a method comprising:

forming device structure [250] on a substrate;

forming masking structure [204, 206 & 208] over the device structure, the masking structure includes an amorphous carbon layer [204] and a cap layer [206], the cap layer including non-oxide materials;

patterning the masking structure to form a patterned masking structure (figure 2D);

etching the device structure using the patterned masking structure as a mask ;  
and removing the patterned masking structure (figure 2E).

Though Fairburn fails to teach the device structure has a gate structure and etching to form a portion of a memory cell, when considering Fairburn does teach the substrate structure is the substrate [200] with other material layers thereon (6, 60+) such as silicides, metals or other materials (7, 6+), one of ordinary skill would know that this could conventionally apply to the formation of a gate structure used in the formation of a memory cell. The use of conventional materials to perform there known functions in a conventional process is obvious (MPEP 2144.07).

Regarding claim 60, Fairburn teaches patterning the masking structure includes: using a patterned photoresist layer [208] as a mask to pattern the cap layer to form a patterned cap layer; and using at least one of the patterned cap layer and the patterned photoresist layer to pattern the amorphous carbon layer (figure 2D & 7, 45+).

As to claim 61, though Fairburn, which teaches using an appropriate chemical etchant (7, 45+), fails to specifically teach the patterning the cap layer is performed by oxygen plasma etch process, it would have been obvious to one of ordinary skill to optimize the etchant to be an oxygen plasma etch (MPEP 2144.05).

In re claim 62, though Fairburn, which teaches using an oxygen plasma process (7, 51+), fails to specifically teach removing the patterned amorphous carbon is performed using an oxygen plasma process with one of CF<sub>4</sub> and H<sub>2</sub>, it would have

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been obvious to one of ordinary skill to optimize the oxygen plasma etch to include one of CF<sub>4</sub> and H<sub>2</sub> because these are conventionally known in the art to be added to oxygen plasma etches. The use of conventional materials to perform there known functions in a conventional process is obvious (MPEP 2144.07).

Claims 63-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fairburn et al. US Patent 6,573,030.

Fairburn teaches a method comprising:

placing a wafer in a chamber, the wafer including at least one die having a substrate [200] and a device structure [250] formed over the substrate;

forming an amorphous carbon layer [204] over the device structure; and

forming a cap layer [206] over the amorphous carbon layer, the cap layer including a material selected from a group consisting of boron carbide, boron nitride, silicon carbide, silicon nitride, fluoride films, fluorine doped with oxide, fluorine doped with nitride, and fluorine doped with carbide (7, 25+).

Though Fairburn fails to teach a wafer in a chamber, the wafer including at least one die having a substrate and a device structure formed over the substrate, when considering Fairburn does teach the substrate [200] refers to any workpiece on which processing is performed (6, 63+), one of ordinary skill would know that this could conventionally apply to the formation of a gate structure used in the formation of a memory cell. The use of conventional materials to perform there known functions in a conventional process is obvious (MPEP 2144.07).



Further, though Fairburn doesn't explicitly teach using a chamber, the teaching of depositing layers implicitly teaches using a chamber because how else would one deposit layers except in a chamber (MPEP 2144.01).

Regarding claim 64, though Fairburn fails to teach the material of the cap layer is in situ deposited over the amorphous carbon layer, it would have been obvious to form the cap layer in situ because this would speed up the processing time. The use of conventional methods to perform their known functions in a conventional process is obvious (MPEP 2144.07).

Regarding claim 65, Fairburn teaches the amorphous carbon layer is transparent in visible light range.

As to claim 66, Fairburn teaches the chamber is a plasma enhanced vapor chemical deposition chamber (2, 38+).

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patents 6,653,735; 6,884,733; 6,875,664; 6,803,313; and 6,825,114 are all cited as teaching the inventions that are 102(e) references.

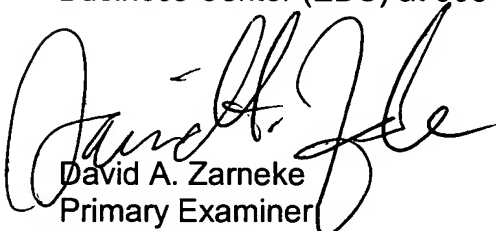
Any inquiry concerning this communication or earlier communications from the examiner should be directed to David A. Zarneke whose telephone number is (571)-272-1937. The examiner can normally be reached on M-Th 7:30 AM-6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Baumeister can be reached on (571)-272-1712. The fax phone

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number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



David A. Zarneke  
Primary Examiner  
June 5, 2005